Method for producing a fibrous web, and monitoring system

Claims

1. A method for producing a fibrous web (1), in particular a paper or board web, from at least one fibrous suspension (2) having a fibrous suspension density (FSD), having at least one circulating wire (4) to which, by means of at least one a headbox (3), the fibrous suspension (2) is applied with a fibrous suspension height (FSH) and which is led over a series of dewatering elements (5, 6, 11, 12, 12.1, 12.2, 14),
characterized
in that the fibrous suspension height (FSH) and/or the fibrous suspension density (FSD) is measured by means of at least one measuring cell (7) which is fitted in a stationary manner and is not in direct contact with the fibrous suspension (2),
in that the measured value obtained is evaluated in an associated process control system (20) of the appropriate paper or board machine and is preferably compared with at least two predefinable limiting values (upper limiting value, lower limiting value), and
in that, depending on the result of the evaluation or if at least one of the predefinable limiting values is violated, at least one actuating element is appropriately automatically activated or influenced via the process control system (20), in order to signal the violation of the limiting value and/or to initiate at least one appropriate countermeasure, with which a further increase or reduction in the fibrous suspension height (FSH) and/or the fibrous suspension density (FSD) of the region monitored is counteracted.

2. The method as claimed in claim 1, characterized in that the fibrous suspension height (FSH) and/or the fibrous suspension density (FSD) is measured by at least one measuring cell (7) fitted in a stationary manner close to the surface (8) in the headbox (3) and/or in the dewatering element (5, 6, 11, 12, 12.1, 12.2, 14) and/or in the framing (15) of the paper or board machine.

3. The method as claimed in claim 1 or 2, characterized in that the fibrous suspension height (FSH) and/or the fibrous suspension density (FSD) - viewed at right angles to the machine running direction (L) - is measured at a plurality of points at a respective distance from one another by means of a plurality of measuring cells (7) fitted in a stationary manner.

4. The method as claimed in claim 3, characterized in that the distance between the measuring points assumes a value in the range from 50 mm to 1000 mm, preferably from 100 mm to 500 mm.

5. The method as claimed in one of the preceding claims, characterized in that the measurement is part of a control system which, moreover, comprises signal conversion following the measurement and data processing to be carried out by means of the process control system (20).

6. The method as claimed in one of the preceding claims, characterized in that, if a relevant limiting value is violated, at least one of the following countermeasures is initiated:
   a) a reduction or increase in the wire speed of the paper or board machine;

b) a reduction or increase in the dewatering performance in the machine running direction (L) upstream of the measuring cell (7);

c) a reduction or increase in the fibrous suspension density (FSD) of the fibrous suspension (2) supplied, by means of

d) a reduction or increase in the quantity of fibrous suspension applied to the circulating wire (4).

7. The method as claimed in claim 6, characterized in that, in order to change the wire speed, at least one drive of the paper or board machine is influenced appropriately.

8. The method as claimed in claim 6, characterized in that, in order to change the fibrous suspension density (FSD), at least the quantity of dilution water supplied to the fibrous suspension (2), the levels of vacuum on individual or a plurality of dewatering elements and/or forming roll vacuum, the metering of chemicals, such as retention aid and the like, and/or the wire tension on the former, for example on the gap former, are influenced appropriately.

9. The method as claimed in claim 6, characterized in that, in order to change the quantity of fibrous suspension applied to the circulating wire (4), at least one headbox pump of the headbox (3) is influenced appropriately.

10. The method as claimed in one of the preceding claims, characterized in that, if a relevant limiting value is violated, an alarm signal is generated.

11. The method as claimed in one of the preceding claims, characterized in that, if a first limiting value is violated, first of all a warning signal is generated and, if a further limiting value is violated, at least one appropriate countermeasure is initiated.

12. The method as claimed in one of the preceding claims, characterized in that the headbox (3) comprises at least one headbox slice (17), a dividing element (18) and a slat (19) and/or the like.

13. The method as claimed in one of the preceding claims, characterized in that the dewatering element (5, 6, 11, 12, 12.1, 12.2, 14) comprises at least one forming roll (11), a forming foil (6), a skimmer strip (6), a supporting strip (6), a sealing strip (12, 12.1, 12.2), a dewatering box (14), a foil box and/or the like.

14. A system for monitoring at least one fibrous suspension (2) used during the production of a fibrous web (1), in particular a paper or board web, and having both a fibrous suspension density (FSD) and a fibrous suspension height (FSH), which is brought by means of at least one headbox (3) to at least one circulating wire (4), which is led over a series of dewatering elements (5, 6, 11, 12, 12.1, 12.2, 14),
characterized
in that at least one measuring cell (7) which is fitted in a stationary manner and is not in direct contact with the fibrous suspension (2) is provided for measuring the fibrous suspension height (FSH) and/or the fibrous suspension density (FSD),

in that the measuring cell (7) is connected to a process control system (20) associated with the paper or board machine, the measured value determined by the measuring cell (7) being evaluated in the process control system (20) and preferably compared with the at least two predefinable limiting values (upper limiting value, lower limiting value), and
in that, depending on the result of the evaluation or if at least one of the predefinable limiting values is violated, it is possible for at least one actuating element to be automatically activated or influenced appropriately by the process control system (20), in order to signal the violation of the limiting value and/or to initiate at least one appropriate countermeasure, with which a further increase or reduction in the fibrous suspension height (FSH) and/or the fibrous suspension density (FSD) of the region monitored is counteracted.

15. The monitoring system as claimed in claim 14, characterized in that the measuring cell (7) fitted in a stationary manner and close to the surface (8) for measuring the fibrous suspension height (FSH) and/or the fibrous suspension density (FSD) is provided in the headbox (3) and/or in the dewatering element (5, 6, 11, 12, 12.1, 12.2, 14) and/or in the framing (15) of the paper or board machine.

16. The monitoring system as claimed in claim 15, characterized that in that the measuring cell (7) fitted in a stationary manner is embedded in a component surrounding it.

17. The monitoring system as claimed in claim 15, characterized in that the measuring cell (7)

fitted in a stationary manner is introduced into a preferably specifically produced hollow space (13).

18. The monitoring system as claimed in claim 15, characterized in that the measuring cell (7) fitted in a stationary manner is enclosed, at least with respect to the side of the wire (4).

19. The monitoring system as claimed in claim 15, characterized in that the measuring cell (7) fitted in a stationary manner forms part of the surface of the dewatering element (5, 6, 11, 12, 12.1, 12.2, 14).

20. The monitoring system as claimed in one of claims 14 to 19, characterized in that a plurality of measuring cells (7) fitted in a stationary manner for measuring the fibrous suspension height (FSH) and/or the fibrous suspension density (FSD) - viewed at right angles to the machine running direction (L) - are provided at a plurality of points at a respective distance from one another.

21. The monitoring system as claimed in claim 20, characterized in that the distance between the measuring points assumes a value in the range from 50 mm to 1000 mm, preferably from 100 mm to 500 mm.

22. The monitoring system as claimed in either of claims 20 and 21, characterized in that the measuring cells (7) are connected to one another via appropriate lines (9), in particular cables, and are supplied to a preferably common signal converter (10).

23. The monitoring system as claimed in either of claims 20 and 21, characterized in that the transmission of the measured values to a preferably common signal converter (10) is carried out by means of a radio transmission.

24. The monitoring system as claimed in one of claims 14 to 23, characterized in that the measuring cell (7) comprises at least one radioactive source, in particular a Gamma Gage, a laser unit, an ultrasound unit and/or the like.

25. The monitoring system as claimed in one of claims 14 to 24, characterized in that the measurement is part of a control system which, moreover, comprises signal conversion following the measurement and data processing to be carried out by means of the process control system (20).

26. The monitoring system as claimed in one of claims 14 to 25, characterized in that the process control system (20) is designed in such a way that, if a relevant limiting value is violated, at least one of the following countermeasures is initiated:

a) a reduction or increase in the wire speed of the paper or board machine;
b) a reduction or increase in the dewatering performance in the machine running direction (L) upstream of the measuring cell (7);
c) a reduction or increase in the fibrous suspension density (FSD) of the fibrous suspension (2) supplied, by means of
d) a reduction or increase in the quantity of fibrous suspension applied to the circulating wire (4).

27. The monitoring system as claimed in claim 26, characterized in that, in order to change the wire speed, at least one drive of the paper or board machine can be influenced appropriately.

28. The monitoring system as claimed in claim 26, characterized in that, in order to change the fibrous suspension density (FSD), at least the quantity of dilution water supplied to the fibrous suspension (2), the levels of vacuum on individual or a plurality of dewatering elements and/or forming roll vacuum, the metering of chemicals, such as retention aid and the like, and/or the wire tension on the former, for example on the gap former, can be influenced appropriately.

29. The monitoring system as claimed in claim 26, characterized in that, in order to change the quantity of fibrous suspension applied to the circulating wire (4), at least one headbox pump of the headbox (3) can be influenced appropriately.

30. The monitoring system as claimed in one of claims 14 to 29, characterized in that, if a relevant limiting value is violated, an alarm signal can be generated.

31. The monitoring system as claimed in one of claims 14 to 30, characterized in that, if a first limiting value can be violated, first of all a warning signal can be generated and, if a further limiting value is violated, at least one appropriate countermeasure can be initiated.

32. The monitoring system as claimed in one of claims 14 to 31, characterized in that the headbox (3) comprises at least one headbox slice (17), a

dividing element (18) and a slat (19) and/or the like.

33. The monitoring system as claimed in one of claims 14 to 32, characterized in that the dewatering element (5, 6, 11, 12, 12.1, 12.2, 14) comprises at least one forming roll (11), a forming foil (6), a skimmer strip (6), a supporting strip (6), a sealing strip (12, 12.1, 12.2), a dewatering box (14), a foil box and/or the like.